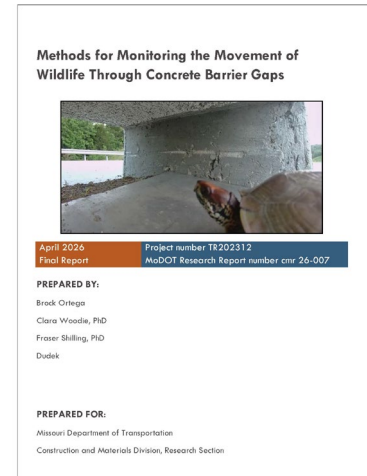


Research Summary

Use of Scupper-Modified Jersey Barriers by Small Wildlife Along a New Segment of I-49 in Southwestern Missouri

The Missouri Department of Transportation (MoDOT) implemented an innovative design to address the barrier effect of traditional concrete Jersey barriers on small-bodied wildlife. While these barriers significantly reduce cross-median collisions and improve traffic safety, they create impermeable obstacles that fragment habitats and restrict movement for amphibians, reptiles, and small mammals. To mitigate these impacts, MoDOT installed wildlife median barriers featuring modified scupper openings at the base of the barriers to allow passage. This study evaluated the effectiveness of wildlife median barriers along a 4.66-mile segment of Interstate 49 in McDonald County, Missouri (Study Area) and developed monitoring strategies to assess wildlife use.

The research employed a multi-method approach, including road mortality surveys, camera monitoring within scuppers, roadside and culvert camera studies, coverboard surveys, and environmental DNA (eDNA) sampling. Results indicate that scuppers are used by a variety of species. Cameras documented frequent use by rodents, occasional armadillos, and rare amphibians and reptiles, while eDNA revealed a broader biodiversity signal, detecting amphibians, reptiles, and small mammals not observed visually. Amphibian roadkill peaked during rainfall events, while reptile mortality was concentrated in warmer months, indicating seasonal movement patterns. Comparative analysis showed eDNA consistently detected more species than cameras, underscoring its value for identifying cryptic or nocturnal taxa, while



cameras provided direct behavioral evidence of crossings by high-use species.

Camera studies resulted in millions of image captures. After removing false-positive data and combining individual-specific data, this resulted in the detection of 31 species and more than 3,300 individual animals. The cumulative camera study captured 4 amphibians, 1 reptile, 5 birds, and 21 mammals. At the scuppers, four amphibians (American bullfrog *Lithobates catesbeianus*, American toad *Anaxyrus americanus*, general amphibian, and frog/toad), one reptile species (three-toed box turtle *Terrapene carolina*), and seven mammal species (coyote *Canis latrans*, domestic dog *Canis familiaris*, nine-banded armadillo *Dasypus novemcinctus*, northern raccoon *Procyon lotor*, eastern cottontail *Sylvilagus floridanus*, plains pocket gopher *Geomys bursarius*, and generic rodent) were detected.

The eDNA study provided an augmented snapshot of biodiversity associated with scuppers and surrounding roadside features along the Interstate 49 Study Area. Using multiple primer sets, a total of 745 distinct organisms were identified from scupper detritus, adjacent roadside soils, and culvert water, though only a subset were expected to have a high probability of originating from actual scupper use. Species richness metrics showed higher richness in scupper detritus compared to soil samples collected near scuppers, suggesting these features facilitate animal movement across the median. However, detection of eDNA at a roadway feature indicates the presence of genetic material but does not confirm live



animal presence, residency, or use of the feature. Therefore, eDNA results should be interpreted as probabilistic indicators of recent regional presence and evaluated alongside complementary survey methods. Combined camera and scupper data indicated with higher confidence that 26 species or species groups (e.g.

“Scupper-modified barriers are a cost-effective solution to improve connectivity for small wildlife.”

Overall, scupper-modified barriers represent a cost-effective approach to improving connectivity for small wildlife. While direct evidence of complete crossings remained limited, converging lines of evidence confirm scupper use and their potential role in mitigating habitat fragmentation. Future projects should place scuppers at intervals informed by species movement patterns, integrate multiple monitoring methods, and consider complementary mitigation measures such as fencing or dedicated wildlife crossings in high-risk areas. This study demonstrates that pairing innovative barrier design with advanced monitoring techniques can enhance ecological connectivity while maintaining roadway safety.



Figure 1. Three-toed Box Turtle in Scupper

Project Information

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